

LIGNOTUBERS OF EUCALYPTUS

E. L. Barnard and K. R. Langdon

Eucalypts are widely grown in southern Florida as ornamentals and as a potential forest crop. Nearly all eucalypts grown in the state are started as seedlings or small trees in containers of various descriptions. These trees frequently come under the watchful eyes of nurserymen, foresters, plant inspectors, consumers, and others during their early years. Consequently, the Division of Plant Industry's technical bureaus are occasionally confronted with inquiries as to the identity and/or cause(s) of "galls" or "swellings" on seedling stems at or near the soil line. Specimens of these unique hypertrophies have been submitted for examination as possible insect galls, pathogen-related galls, and/or physiological abnormalities. Of twenty-four specimen reports recovered from the Plant Pathology Bureau files, the following diagnoses are recorded: 1 - physiological?, 2 - *Agrobacterium tumefaciens* (crown gall bacterium), 16 - unknown, and 5 - healthy. Not until recent months have we properly recognized these growths as "lignotubers".

LIGNOTUBERS DEFINED. In 1925, Kerr (4) introduced the term "lignotuber" to describe the bulbous tissue masses which normally occur at the stem bases of most *Eucalyptus* spp. In Florida, the widely planted *E. grandis* Hill ex Maiden and *E. camaldulensis* Dehnh. are noteworthy exceptions in that they do not form lignotubers (3,5). Although suspicion as to the pathological nature of lignotubers has apparently had a long history (2,5), lignotubers are in fact organs of food storage and regeneration (1,3,5). These organs originate from accessory meristematic tissue and/or buds in the axils of the cotyledons or the first few seedling leaves (1,3,5). Small axillary protuberances, usually in pairs, develop within weeks to months following seed germination, depending upon the species of *Eucalyptus* (1,3,5). As seedlings age, these protuberances fuse, increase in size, and ultimately give rise to the tissue masses known as lignotubers (3,5). According to Jacobs (3), developing lignotubers "tend to fold down the stem and envelop the upper part of the root in somewhat the same way as callus growth folds over a fire scar." He further points out that with increasing age and

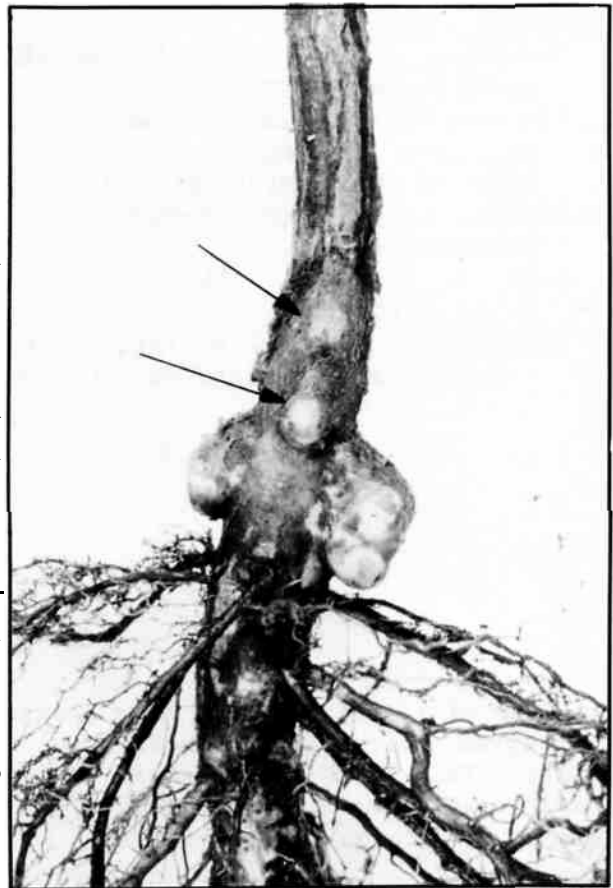


Fig. 1. Lignotubers at the base of a young *Eucalyptus amplifolia* seedling. Note the smaller, developing lignotubers (arrows) above the larger, more mature individuals nearest the plant's root system. (DPI Photo #702573-3)

¹Forest Pathologist, Divisions of Forestry and Plant Industry, and Botanist, Division of Plant Industry, respectively, P. O. Box 1269, Gainesville, FL 32602.

size lignotubers may "bury themselves until the greater part is below the soil surface." If stems become buried by soil movement, Jacobs continues, "a series of swellings may form from the positions of old leaf axils."

FUNCTION OF LIGNOTUBERS. Lignotubers are significant in that they provide eucalypts with tremendous regenerative capacity, a function directly related to stored food reserves as well as the incorporation and/or endogenous production of dormant, proventitious buds (1,3,5). In the event that the aerial portions of parent eucalypts are destroyed by insects, fire, or other agents, the buds and food reserves in the lignotubers enable aggressive new shoots to sprout when environmental conditions are favorable. Should repeated destructions of new shoots occur, lignotubers increase in size and replacement shoots are produced as long as repeated destructions are sufficiently separated in time. Interestingly, each successive generation of shoots is apparently stronger than its predecessor (3,5). As long as the crowns of parent eucalypts remain healthy, the proventitious buds in lignotubers remain dormant, presumably due to the influence of growth substances (hormones) produced in the crowns (3). The subterranean habit characteristic of the lignotubers of many *Eucalyptus* spp. provides a particular survival advantage against fire, a common component of many Australian forest ecosystems.

SURVEY AND DETECTION. Lignotubers may vary in size and shape depending upon host *Eucalyptus* spp. In general, lignotubers appear as distinct hemispherical or bulbous tissue masses occurring singly or in clusters at or near the stem bases of their hosts (Fig. 1). Removal of the soil at stem bases may be necessary for detection since many lignotubers eventually assume a subterranean habit.

LITERATURE CITED.

1. Chattaway, M. M. 1958. Bud development and lignotuber formation in eucalypts. *Aust. J. Bot.* 6:103-115.
2. Fletcher, J. J. , and Musson, C. T. 1918. On certain shoot bearing tumours of eucalypts and angophoras and their modifying influence on the natural growth habit of the plants. *Proc. Linn. Soc. N.S.W.* 43:191-233.
3. Jacobs, M. R. 1955. Growth habits of the eucalypts. *Commonw. Govt. Printer. Canberra* 262pp.
4. Kerr, L. R. 1925. The lignotubers of eucalypt seedlings. *Proc. Royal Soc. Vict.* 37(1):79-97.
5. Penfold, A. R., and Willis, J. L. 1961. The eucalypts: botany, cultivation, chemistry and utilization. *Interscience Publishers, Inc. New York.* 550pp.

¹The buds of lignotubers are more correctly described as "proventitious" (5) as they are derived (directly or indirectly) from axillary buds independently of external stimuli. This is in contrast to the more generally recognized "adventitious" buds of many plant species which lack an axillary bud relationship and are formed only in response to external stimuli.